

What is claimed is:

1. A processed object processing apparatus that processes objects to be processed, comprising:

5 a plurality of treatment systems that are communicably connected together in a line and in which the objects to be processed are processed; and

a load lock system that is communicably connected to said treatment systems, said load lock system having a transfer mechanism that transfers the objects to be processed into and out of each of said treatment systems;

10 wherein at least one of said treatment systems is a vacuum treatment system, and said load lock system is disposed in a position such as to form a line with said treatment systems.

2. A processed object processing apparatus that processes objects to be processed, comprising:

a COR treatment system in which the objects to be processed are subjected to COR treatment;

20 at least one vacuum treatment system in which the objects to be processed are subjected to other treatment, said COR treatment system and said at least one vacuum treatment system being communicably connected together in a line; and

25 a load lock system that is communicably connected to said COR treatment system and said at least one vacuum treatment system, said load lock system having a transfer mechanism that transfers the objects to be processed into and out of each of said COR treatment system and said at least one vacuum treatment system.

3. A processed object processing apparatus as claimed in claim 2, wherein said at least one vacuum treatment system is a heat treatment system that is connected to said COR treatment system, heat treatment is carried out on objects to be processed that have been

subjected to the COR treatment.

4. A processed object processing apparatus as claimed in claim 3, wherein said COR treatment system and said heat treatment system are always in a vacuum state.

5 5. A processed object processing apparatus as claimed in claim 2, wherein said load lock system is disposed in a position such as to form a line with said at least one vacuum treatment system.

6. A processed object processing method for a  
10 processed object processing apparatus including at least a load lock system, a COR treatment system in which objects to be processed are subjected to COR treatment, a heat treatment system in which heat treatment is carried on the objects to be processed that have been subjected  
15 to the COR treatment, and a loader module communicably connected to the load lock system, the method comprising:

a first load lock system transfer-in step of transferring a first object to be processed into the load lock system;

20 a first evacuating step of evacuating the load lock system after execution of the first load lock system transfer-in step;

a first COR treatment system transfer-in step of transferring the first object to be processed into the  
25 COR treatment system after the evacuation in said first evacuating step has been completed;

a COR treatment commencement step of commencing COR treatment on the first object to be processed;

a second lock system transfer-in step of  
30 transferring a second object to be processed into the load lock system during the COR treatment on the first object to be processed;

a second evacuating step of evacuating the load lock system after execution of said second load lock system  
35 transfer-in step;

a first transfer step of transferring the first object to be processed from the COR treatment system into the heat treatment system after the evacuation in said second evacuating step has been completed and after the  
5 COR treatment on the first object to be processed has been completed;

a second transfer step of transferring the second object to be processed from the load lock system into the COR treatment system;

10 a simultaneous treatment commencement step of commencing COR treatment on the second object to be processed in the COR treatment system, and commencing heat treatment on the first object to be processed in the heat treatment system;

15 a third transfer step of transferring the first object to be processed from the heat treatment system into the load lock system after the heat treatment on the first object to be processed has been completed; and

a replacing step of communicating the load lock  
20 system and the loader module with one another to replace the first object to be processed in the load lock system with a third object to be processed waiting in the loader module.

7. A pressure control method for a processed  
25 object processing apparatus comprising at least a load lock system, a COR treatment system in which objects to be processed are subjected to COR treatment, a heat treatment system in which heat treatment is carried out on objects to be processed that have been subjected to  
30 the COR treatment, and a loader module from and into which the objects to be processed are transferred into and from the load lock system, the method comprising:

a transfer-in step of placing the load lock system into an atmospheric pressure state and transferring an  
35 object to be processed that has not been subjected to COR

treatment from the loader module into the load lock system, while evacuating the heat treatment system;

a load lock system evacuating step of terminating the evacuation of the heat treatment system, and  
5 evacuating the load lock system down to a set pressure;

a heat treatment system evacuating step of terminating the evacuation of the load lock system after the load lock system has reached the set pressure, and evacuating the heat treatment system so as to satisfy a  
10 condition that pressure inside the heat treatment system is less than pressure inside the load lock system; and

a first communicating step of communicating the load lock system with the heat treatment system while continuing to exhaust the heat treatment system after the  
15 condition that the pressure inside the heat treatment system is less than the pressure inside the load lock system has been satisfied.

8. A pressure control method as claimed in claim 7, further comprising:

20 a first pressure monitoring step of monitoring the pressure inside the heat treatment system, after execution of said first communicating step;

a COR treatment system exhausting step of exhausting the COR treatment system while continuing to exhaust the  
25 heat treatment system such as to satisfy a condition that the pressure inside the heat treatment system is less than pressure inside the COR treatment system; and

a second communicating step of terminating the exhaustion of the COR treatment system when the condition  
30 that the pressure inside the heat treatment system is less than the pressure inside the COR treatment system has been satisfied, and communicating the heat treatment system with the COR treatment system while continuing to exhaust the heat treatment system.

35 9. A pressure control method as claimed in claim 8,

further comprising an influx step of introducing fluid into the load lock system and the COR treatment system, after execution of said second communicating step.

10. A pressure control method as claimed in claim 9,  
5 wherein a flow rate of fluid from the load lock system into the heat treatment system, and a flow rate of fluid from the COR treatment system into the heat treatment system are equal to one another.

11. A pressure control method as claimed in claim 8,  
10 further comprising an exhausting step of exhausting the heat treatment system and the COR treatment, thus setting the pressure inside the COR treatment system to a static elimination pressure for eliminating residual ESC charge, after object to be processed that has been subjected to  
15 the COR treatment has been transferred out from the COR treatment system.

12. A pressure control method for a processed object processing apparatus including at least a COR treatment system in which objects to be processed are  
20 subjected to COR treatment, and a heat treatment system in which heat treatment is carried out on the objects to be processed that have been subjected to the COR treatment, the method comprising:

a pressure monitoring step of monitoring pressure  
25 inside the heat treatment system while exhausting the heat treatment system;

a COR treatment system exhausting step of exhausting the COR treatment system such as to satisfy a condition that the pressure inside the heat treatment system is  
30 less than pressure inside the COR treatment system; and

a communicating step of terminating the exhaustion of the COR treatment system when the condition that the pressure inside the heat treatment system is less than the pressure inside the COR treatment system has been  
35 satisfied, and communicating the heat treatment system

with the COR treatment system.

13. A processed object processing apparatus that processes objects to be processed, comprising:

5 a first treatment system in which the objects to be processed are subjected to first treatment;

a second treatment system that is communicably connected to said first treatment system and in which the objects to be processed are subjected to second treatment; and

10 a load lock system that is interposed between said first treatment system and said second treatment system and is communicably connected to each of said first treatment system and said second treatment system, said load lock system having a transfer mechanism that  
15 transfers the objects to be processed into and out of each of said first treatment system and said second treatment system.

14. A processed object processing apparatus as claimed in claim 13, wherein said second treatment system  
20 is a cooling treatment system in which cooling treatment is carried out on the objects to be processed that have been subjected to the first treatment.

15. A processed object processing apparatus as claimed in claim 14, wherein said first treatment system  
25 is always in a vacuum state, and said second treatment system is always in an atmospheric pressure state.

16. A processed object processing apparatus as claimed in claim 15, wherein said load lock system is disposed in a position such as to form a line with said  
30 first treatment system and said second treatment system.

17. A processed object processing method for a processed object processing apparatus including at least a load lock system, a vacuum treatment system in which objects to be processed are subjected to vacuum  
35 treatment, an atmospheric treatment system in which

cooling treatment is carried out on the objects to be processed that have been subjected to the vacuum treatment, and a loader module, the method comprising:

5 a load lock system transfer-in step of transferring an object to be processed from the loader module into the load lock system;

a first vacuum/atmospheric pressure switching step of evacuating said load lock system after execution of said load lock system transfer-in step;

10 a vacuum treatment system transfer-in step of transferring the object to be processed into the vacuum treatment system after execution of said first vacuum/atmospheric pressure switching step;

15 a vacuum treatment step of carrying out vacuum treatment on the object to be processed that has been transferred into the vacuum treatment system;

a load lock system transfer-out step of transferring the object to be processed that has been subjected to the vacuum treatment out into the load lock system;

20 a second vacuum/atmospheric pressure switching step of opening an interior of the load lock system to atmospheric air after execution of said load lock system transfer-out step;

25 an atmospheric treatment system transfer-out step of transferring the object to be processed from the load lock system out into the atmospheric treatment system;

30 an atmospheric treatment step of carrying out cooling treatment on the object to be processed that has been transferred out into the atmospheric treatment system; and

a loader module transfer-out step of transferring the object to be processed that has been subjected to the cooling treatment out into the loader module.

18. A processed object transfer method for transfer  
35 means in a processed object processing apparatus

including at least a load lock system having the transfer means which transfers objects to be processed, a vacuum treatment system in which the objects to be processed are subjected to vacuum treatment, a heat treatment system in  
5 which heat treatment is carried out on the objects to be processed that have been subjected to the vacuum treatment, and a loader module communicably connected to the load lock system, the method comprising:

10 a load lock system transfer-in step of transferring an object to be processed into the load lock system;

an evacuating step of evacuating the load lock system after execution of said load lock system transfer-in step;

15 a vacuum treatment system transfer-in step of transferring the object to be processed into the vacuum treatment system after the evacuation in said evacuating step has been completed;

20 a vacuum treatment commencing step of commencing vacuum treatment after execution of said vacuum treatment system transfer-in step;

a first transfer step of transferring the object to be processed from the vacuum treatment system into the heat treatment system after the vacuum treatment has been completed;

25 a heat treatment commencing step of commencing heat treatment in the heat treatment system;

a second transfer step of transferring the object to be processed from the heat treatment system into the load lock system after the heat treatment has been completed;

30 and

a loader module transfer-out step of communicating the load lock system and the loader module with one another and transferring the object to be processed out into the loader module.

35 19. A processed object transfer method for transfer



means in a processed object processing apparatus including a heat treatment system that has a first stage and in which heat treatment is carried out on an object to be processed which has been placed on the first stage,

5 a vacuum treatment system that has a second stage and in which vacuum treatment is carried out on the object to be processed which has been placed on the second stage, a load lock system that is disposed for communication with the heat treatment system and the vacuum treatment system

10 and has the transfer means which transfers the object to be processed, and a controller that controls the transfer means, the transfer means having a processed object holding part that holds the object to be processed and is freely movable through the heat treatment system and the vacuum treatment system, the processed object holding

15 part having first detecting means for detecting information relating to whether or not the object to be processed is present, at least one of the first stage and the second stage having second detecting means for

20 detecting information relating to whether or not the object to be processed is present, and the controller detecting a position of the object to be processed based on the detected information, the method comprising:

a first positional relationship detecting step of

25 detecting a first relative positional relationship between a center of the object to be processed in an initial position and a center of one of the first stage and the second stage;

a transfer step of determining a transfer route for

30 the object to be processed based on the detected first relative positional relationship, and transferring the object to be processed along the determined transfer route;

a second positional relationship detecting step of

35 detecting a second relative positional relationship

between the center of the object to be processed after having been transferred to the one of the first stage and the second stage and the center of the object to be processed in the initial position; and

- 5           a position correcting step of correcting the position of the object to be processed based on a difference between the first relative positional relationship and the second relative positional relationship.

10           20. A processed object transfer method as claimed in claim 19, further comprising a processed object holding part rotating step of rotating the processed object holding part while the processed object holding part is still holding the object to be processed, so as  
15           to align a position of a reference plane of the object to be processed that has been subjected to the position correction with a predetermined position.

          21. A processed object transfer method as claimed in claim 19, wherein the center of the object to be  
20           processed in the initial position is a center of the object to be processed in the load lock system before transfer.

          22. A processed object transfer method for transfer means in a processed object processing apparatus  
25           including a load lock system that is communicably connected to a heat treatment system having a first stage, in which heat treatment is carried out on an object to be processed which has been placed on the first stage, the load lock system being communicably connected, via the  
30           heat treatment system, to a vacuum treatment system having a second stage, in which vacuum treatment is carried out on the object to be processed which has been placed on the second stage, the load lock system having the transfer means which transfers the object to be  
35           processed, the transfer means comprising a transfer arm

that comprises at least two arm-shaped members, the arm-shaped members being rotatably connected together at one end of each thereof, and a processed object holding part that is connected to another end of one of the arm-shaped members and holds the object to be processed, the method comprising:

a processed object moving step of rotating the processed object holding part in a plane parallel to a surface of the object to be processed about the other end of the one of the arm-shaped members, rotating the one of the arm-shaped members in a plane parallel to the surface of the object to be processed about the one end of the one of the arm-shaped members, and rotating the other one of the arm-shaped members in a plane parallel to the surface of the object to be processed about the other end of the other one of the arm-shaped members.

23. A processed object transfer method as claimed in claim 22, wherein in said processed object moving step, the arm-shaped members and the processed object holding part are rotated in cooperation with one another so as to move the object to be processed along a direction of disposition of the first stage and the second stage.

24. A transfer apparatus that is provided in a load lock system that is communicably connected to a heat treatment system, having a first stage, in which heat treatment is carried out on an object to be processed which has been placed on the first stage, the load lock system being communicably connected, via the heat treatment system, to a vacuum treatment system having a second stage, in which vacuum treatment is carried out on the object to be processed which has been placed on the second stage, the transfer apparatus comprising:

a transfer arm that comprises at least two arm-shaped members, said arm-shaped members being rotatably connected together at one end of each thereof; and

a processed object holding part that is connected to another end of one of said arm-shaped members and holds the object to be processed;

wherein said processed object holding part is  
5 disposed to be rotated in a plane parallel to a surface of the object to be processed about the other end of the one of said arm-shaped members, and the one of said arm-shaped members is disposed to be rotated in a plane  
10 parallel to the surface of the object to be processed about the one end of the one of said arm-shaped members, and the other one of said arm-shaped members is disposed to be rotated in a plane parallel to the surface of the object to be processed about the other end of the other one of said arm-shaped members.

15 25. A transfer apparatus as claimed in claim 24, wherein said arm-shaped members and said processed object holding part are disposed to be rotated in cooperation with one another so as to move the object to be processed along a direction of disposition of the first stage and  
20 the second stage.